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The St. Louis Public Library's Electronic Atlas: A Successful GIS Application in the Public Library Environment

In 1974, the U.S. Census Bureau published a collection of thematic maps from the 1970 census. The maps found a wide audience during the decade. However, the bureau did not produce a companion set from either the 1980 or 1990 censuses. Other organizations have responded to the demands of data users with comparable products. Rather than producing a published set of thematic maps, the St. Louis Public Library (SLPL), with the Illinois State Data Center at Southern Illinois University at Edwardsville, decided to produce an electronic set of thematic maps using 1990 U.S. Census data. The St. Louis Public Library's electronic atlas began with clearly defined goals, modest expenditures, and a wide range of community partnerships. As the electronic atlas enters its third year of operation, it is possible for the participants to discuss the components of a successful implementation of Geographic Information System (GIS) technologies in a public library environment.

The St. Louis Public Library (SLPL) dates its beginning to the Public School Library Society of St. Louis, which was established on February 3, 1865. Shortly after its founding in 1865, the library was designated a federal depository library, making St. Louis Public Library the oldest such depository west of the Mississippi River. The library's federal document collection is one of the oldest and largest in the region, numbering approximately 1.5 million items including approximately 110,000 paper maps.

As part of its mission, the library has actively worked within the St. Louis community to see that the public is made aware of the riches in its collections. The library pioneered in the utilization of electronic databases by the public, placing its catalog in high schools, public agencies, and other community facilities across the city and encouraging public dial-in to the library's catalog through desktop. The library provides public access computers to both children and adults for activities ranging from word processing to full-text and bibliographic database searching. In addition, the library has actively worked within the St. Louis community to see that the public is made aware of the resources in its local, state, and federal document collections by conducting community workshops, training sessions, and participating in the data user community.

At the same time, the Illinois State Data Center Cooperative program, located in Regional Research and Development Services (RRDS) at Southern Illinois University–Edwardsville, has aggressively pursued a data dissemination partnership arrangement with the St. Louis Public Library and other libraries in downstate Illinois and eastern Missouri. Both institutions are active participants in the St. Louis metropolitan data user community with memberships in such groups as the United Way Research Committee; the American Statistical Association, St. Louis Chapter; and Midwest Gateway Chapter of the Urban and Regional Information Systems Association (URISA).

The St. Louis Public Library's Decennial Census collection dates from 1790. Many of these earlier publications continue to be important reference sources years after their original publication. One such publication followed the 1970 census when the U.S. Census Bureau produced a series of thematic maps using popular census data items. The maps were published under the title, *Urban Atlas, Tract Data for Standard Metropolitan Statistical Areas: St. Louis, Missouri—Illinois* (U.S. Bureau of the Census, 1974) and contained topical colored maps at the census tract level. The maps classed and displayed data reflecting a range of themes of interest to urban demographers. These maps were used in a variety of census data applications to illustrate the spatial distribution of special population groups, trends in population change, and interrelationships among classes of census variables. Typically, library users would photocopy the maps and incorporate the graphics in reports and presentations. The colors used in the maps were sufficiently different to allow black and white photocopying and reduction.

The urban atlas was a very successful product. The collection of thematic maps allowed users to illustrate data and conceptual points graphically, and the tract reference maps provided a handy resource for identifying geographic area locations by census tract number. Unfortunately, the Census Bureau did not produce companion sets of maps following the 1980 and 1990 censuses. However, because of its popularity, ease of use, and ease of comprehension, other users and disseminators of census data thought it important to undertake the task of producing an atlas product. The East-West Gateway Coordinating Council (EWGCC), which serves as the major transportation planning agency for the St. Louis metropolitan area, produced a two volume set of maps following the 1980 census which went beyond the data elements and urban geographical components of the bureau's 1970 urban atlas (EWGCC, 1982). EWGCC's urban atlas extended mapping coverage to the less urbanized counties of the metropolitan area. The themes depicted in the maps were also expanded.

For 1990, the St. Louis Public Library and Regional Research and Development Services at Southern Illinois University at Edwardsville planned to produce an urban atlas which would replicate many of the

same maps found in the bureau's 1970 urban atlas and East-West Gateway's 1980 urban atlas.

As the SLPL and RRDS began to work on the 1990 version of an urban atlas, several questions and concerns emerged from the discussions. First and foremost was the cost of a paper product. Second, questions arose about the classing of the census variables. With the availability of Geographic Information System technology, it became easier to experiment with a wider range of classing schemes, and the system developers anticipated that users would want to utilize these options in the preparation of their maps. Third, the amount of data that would be mapped in a paper atlas was limited to a few tables from the complete count and sample tape products.

With the intent of providing as much data as possible, it became obvious that there would be requests for other thematic maps and, ultimately, the additional data compilation would be more beneficial to users than only maps by themselves. For these reasons, the development of a paper 1990 urban atlas became less of a priority and, indeed, took a back seat to data processing and planning operations for the release of tapes and CD-ROM census products following the 1990 census.

A number of significant developments took place in the Geographic Information System software market during 1992. The cost of GIS software became less expensive, and the capabilities in GIS toolboxes were increasing. Several software developers choose to segment their GIS software markets by offering desktop mapping products to be used with their GIS toolboxes. One of these companies was Environmental Systems Research Institute (ESRI). With the availability of tract maps in digital form, census data in machine readable form, and software to display both forms of data, the idea of generating an "electronic atlas" began to take shape.

The St. Louis Public Library had planned a large map exhibit highlighting maps from its own collections for fall 1992. As part of the "Roads, Rails, Rivers, and Rifles" exhibit, the library wanted to look at the possibilities of electronic mapping. Plans for the exhibit called for workstations that provided the public with an opportunity to work with several commercial software atlases. The *St. Louis Public Library Electronic Atlas* was to be the highlight of this display.

In July 1992, a formal proposal was made to create an electronic atlas of census tract maps and data from the complete count and sample compilations. The electronic atlas has been limited to St. Louis City and County census tract data and maps. As the original concept was developed, the electronic atlas was to have thematic displays of census tract data allowing for the addition of new levels of geography or data over time. The budget required that we minimize system development costs, assuring a more cost-effective solution than hard copy color maps.

One additional requirement of the library system was that it needed to be both user friendly for the novice computer user while offering an environment appropriate for those more experienced in using a GIS. Unlike most other GIS workstations, this one was to be in a public area and would be accessible on a walk-up basis to library patrons of all ages and skill levels.

To implement an electronic atlas for general public use, the St. Louis Public Library purchased an IBM-compatible computer with the following features: an 80486-50mhz CPU with 8Mbytes of random access memory, a 211Mbyte hard disk drive, two floppy drives, one parallel and two serial ports, a tower case, a keyboard, a mouse, a 15 inch 1024 x 768 noninterlaced monitor, and a Windows accelerator video board. In addition to the hardware, SLPL purchased DOS 5.0, Microsoft Windows 3.1, ArcView (ESRI), and two Arc/Info digital map bases. This configuration was bundled as an ArcView Turnkey System by RRDS-SIUE with software and data installation, delivery, and two hours of training.

The library selected the street maps and address databases for St. Louis City and St. Louis County as their base maps. Although the St. Louis Public Library district is the same as the city of St. Louis, many data needs overlap political boundaries. The Regional Commerce and Growth Association of St. Louis (RCGA) had digital census tract maps and street maps prepared by RRDS-SIUE using Arc/Info and the same TIGER data. The digital data were made available to the library gratis. This provided the capability of overplotting census tract outline maps on top of the street base maps.

The ArcView software contains a special capability for building and saving maps or thematic "views" of tabular data. With this capability, thematic maps were created and stored as data files. The thematic maps are available to the user through program groups and program items in the Windows environment. The series of census data views are organized by city and county. The view and data dictionaries are organized in a separate program icon grouping, assuring ready access to needed documentation. In addition to views of census data, other geographic data products have been incorporated. With ArcView's ability to display satellite imagery, a spectrally enhanced Landsat Thematic Mapper image and a SPOT Image Corporation panchromatic image of a portion of the St. Louis metropolitan area were included.

Initially, access to the full range of functions available on the system was unlimited. The library staff soon determined that some limitation of patron access to system functions was essential—e.g., limiting the ability to change predefined maps/views, changing tabular data, and changing some of the system defaults through access to DOS. The pull-down menu options on the menu bar (just below the Program Manager banner) have been al-

tered to restrict user access to DOS and the Windows environment. Users cannot alter predefined views, spatial data, or tabular data. These changes were made incrementally over the first two months that the system was in place. The present limitations seem adequate to both protect the system and provide users with the full range of options necessary to produce the types of maps needed. Such limitations are essential for user and general system success in a public environment such as the library's.

Using the system is relatively straightforward. By double clicking on a program group, program icons become available to the user, the ArcView program is executed, and the corresponding view is automatically brought to the screen. With the street base maps and the address indexes for both St. Louis City and County, the electronic atlas provides users with the capability of performing address location queries and creating point maps from address data sets. By choosing the Street and Address Index icon, the system makes the address index available. Selecting the mailbox icon in the graphics window and typing in an address will generate a screen with an arrow pointing to the block of the address requested in the query.

Although reference mapping and address location queries are important features of the system, the main purpose is to give users access to census data in a way that is easily understandable and supportive of additional database querying. This is the system's strong suit. Using the identification function in the toolbox, a user can move the arrow to any census tract polygon on the screen and view the corresponding database record. Also, it is possible to view the entire database while a particular view is displayed.

The system is also able to overplot tract boundaries and select records using spatial criteria or by simply pointing to a feature in the graphics window. Taking this a step further, the electronic atlas can be used to perform simple spatial analyses. For example, a user may wish to determine the total population within a one mile radius from a given address. The electronic atlas could be used to identify the address, overplot census tracts, and then select tracts within one mile of the address. Statistics would then be generated on total population from selected tracts within the mile.

An extremely powerful element of ArcView and the electronic atlas is the capability to display satellite data of portions of St. Louis City and County from classified SPOT and Landsat imagery. With rectified imagery, registered to the same ground-based coordinate system as the census tract and street base maps, it is possible to plot the tract or street maps on top of the imagery.

During the first few months of operation, the system was used largely by patrons from the not-for-profit community, students working in the health care field, and small business developers working on business plans.

Many patrons have required staff assistance working with the system. Others, however, have been able to proceed quite independently. If patrons understand Windows, they can learn to use the system quite easily; those without computer and Windows experience have a more difficult time.

Staff help new users get started and oriented to census geography and the concept of a Geographic Information System. Very few patrons of the library are aware of GISs and the potential of the electronic atlas for assisting them in answering questions. Many have returned after an initial successful experience. Staff assist patrons by suggesting views and legend classifications. For branch patrons and those who cannot or do not want to operate the system, we prepare maps. When users have more complicated data requests or require more functionality than we are able to offer, they are referred to the Illinois or Missouri State Data Centers. They, in turn, refer users to the library when our system will meet their needs.

The library began the project with limited and well-defined goals. The focus of the system was to provide census maps and data that would facilitate the various types of analyses and uses of census tract data. The prearranged thematic views of the more commonly used data items are a recognized limitation. However, offering system users the ability to change classing schemes has compensated for some of these limitations. The developers have also realized that storage and data access was a finite resource. Not all spatial data could be offered on the system with the immediate access that we sought. Because we were able to leverage resources, obtaining data gratis from other community information sources, especially the Regional Commerce and Growth Association, we were able to minimize library costs.

Several other internal organizational issues played a part in the success of the project. The electronic atlas was developed jointly by the library staff who know about user requests, and the State Data Center consultant who knows about GIS and ArcView. In addition, the project had an internal organization champion who was a principal in all phases of project development. Keeping the system open to the public was endorsed strongly by the professional GIS community and the library administration. The library administration was also kept informed during all stages of project development. They were asked about the project when away from the library and were proactive in thinking about the electronic atlas when developing information to share about library services. Implementation of the electronic atlas produced software technologies which were useful to other open-access data systems in the library. Finally, and critical to the ongoing success of the project, the library has received support from various professional communities and library constituencies who have maintained interest in the project.

The library views the electronic atlas as only one component of a larger cartographic database. The staff continues to explore the possibility of using the maps available on ArcUSA for indexing portions of the library's map collections. An in-house index to the paper map collection using askSam has been prepared. The electronic atlas has become a natural extension of St. Louis Public Library's electronic information dissemination program. ArcView has enabled the St. Louis Public Library to "create" a reference tool, much as we would have purchased a reference book in earlier, less interesting, times.

REFERENCES

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